

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS IN OR RELATING TO BREAK SPINNING MACHINES

- (71) We, ELITEX, ZAVODY TEXTILNIHO STROJIRENSTVI, GENERALNI REDITELSTVI, a Czechoslovakian Body Corporate, of Liberec, Czechoslovakia, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 5 This invention relates to a device for starting and shutting-off a break-spinning machine having a plurality of spinning units which units are all primed simultaneously each of the units being provided with a feed mechanism for fibre supply, a spinning chamber, 15 yarn withdrawal rollers, a winding-on roller for the yarn produced and a control mechanism for electrical control of the said members of the machine in adjustable time intervals.
- 20 In U.K. Specification No. 1,084,662, there is described a known method for starting and shutting-off a break-spinning machine in a predetermined sequence of individual operations, which permits, on starting the machine, simultaneous priming of all the spinning units thereof. From the known method a constructional device is known by means of which a simultaneous priming of the spinning 30 units is accomplished when the machine is started. The shafts of the fibre feed mechanism, of the yarn withdrawal rollers and of the yarn winding-on rollers are provided with clutches which are electrically controlled by a control mechanism. The control mechanism 35 is provided with four push-buttons, two of which serve for starting and shutting-off a driving electric motor respectively and the other two of which control a main relay which is provided with three contacts, of which one contact controls three time relays, another contact is designed to bridge one of the push-
- 45 buttons controlling the main relay and, finally, the last contact controls electrically a brake and a clutch of the shaft of the yarn withdrawal rollers. One of the three time relays controls, by means of its contact, a clutch of the shaft of the fibre feed mechanisms. A second of the three time relays determines the start of operation of an auxiliary relay which controls, by means of its 50 contact, on the one hand, a clutch of the shaft of the yarn withdrawal rollers, an auxiliary clutch of an auxiliary shaft and, on the other hand, a brake. The third of the time relays determines the end of operation 55 of the auxiliary relay. A disadvantage of these time relays is that the accuracy of the time values depends on the accuracy of the adjustment, on the one hand, and, on the other hand, mainly on the voltage of the power supply and on the ambient temperature. A permissible variation of the time values of the relay, due to the temperature and the voltage, amounts to  $\pm 10\%$ .
- 60 When a plurality of time relays are used, the inaccuracy of several of these relays attains, owing to the effects mentioned hereinbefore, an overall scattering up to 30%. At high withdrawing speeds of the machine, these tolerances cause a faulty priming of the machine on starting. Another disadvantage resides in that when the count of the yarn being spun is changed, it is necessary also to change the time values of the time relay. Every 65 change of the time values has to be checked by means of a priming test.
- 70 According to the invention there is provided a break-spinning device having a plurality of simultaneously primed break-spinning units, each of which is provided with a feed mechanism for the fibre supply, a break-spinning chamber, yarn withdrawal rollers which are rotatable in two directions, in a 75 80

first of which directions yarn is withdrawn from the chamber and in a second of which directions yarn is fed back into the chamber, a yarn winding-on roller and a control mechanism to control, electrically, in adjustable time intervals, the said members of the machine, wherein the control mechanism for the electric control is connected to a stop switch which arrests the spinning device, a feed switch which controls the fibre feed, a withdrawal switch which controls the direction of rotation of the yarn withdrawal rollers and a brake switch which controls a brake of the yarn winding-on roller, the switches being adjustably arranged within an intervention region of a movable control finger which is driven from a main electric motor of the machine, via a clutch controlled by the control mechanism.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is a schematic diagram of a driving mechanism of a spinning machine with a single spinning chamber,

Figure 2 is a view of a control finger with spaced switches, and

Figure 3 is a wiring diagram of a control mechanism and driving mechanisms.

The spinning machine consists of a plurality of identical spinning units driven and controlled by a central driving and controlling mechanism. Figure 1 represents one of these spinning units, substantially the same as with the already mentioned known embodiment, but complemented with control system according to the invention for simultaneous priming on starting the machine. Each spinning unit comprises a spinning chamber 1, a sliver separating mechanism 2, sliver feed rollers 3, yarn withdrawal rollers 4 and a winding-on roller 5 which winds yarns 6 onto a package 7. Beneath the sliver feed rollers 3 of each spinning unit, there is rotatably mounted a sliver bobbin 8 from which a sliver 9 is withdrawn. The sliver feed rollers 3 are driven from a feed shaft 10 provided with a clutch 11 which is electromagnetically controlled to bring about engagement with or disengagement from a transmission gear 12. The yarn withdrawal rollers 4 are driven from a withdrawal shaft 13 which is provided with a clutch 14 to bring about engagement with or disengagement from a transmission gear 15. The withdrawal shaft 13 is also connected, by means of toothed wheels 16, 17 and 18, with a reversing shaft 19. The reversing shaft 19 is provided with a clutch 20 to bring about engagement with or disengagement from a transmission gear 21. Thus, the withdrawal shaft 13 may rotate in either of two directions as determined by which one of the clutches 14 and 20 is engaged. The yarn winding-on

roller 5 is mounted on a winding-on shaft 22 which is connected by means of toothed wheels 24, 25 and 23, with the withdrawal shaft 13 so that both shafts 13 and 22 always have an identical sense of rotation. The winding-on shaft 22 is provided at its end remote from the roller 5 with a brake 26. The package 7 rests against the winding-on roller 5, the latter rotating the package by friction and traversing the yarn 6 into a cross wound package. The mutually meshing gears 12, 15 and 21 are driven from a main electric motor 32 by the intermediary of a transmission of toothed wheels 27, 28, 29, 30 and 31. The main electric motor 32 also drives a belt pulley 33 and, by means of a belt 34, all the spinning chambers 1. For improved clarity, only one spinning unit with one spinning chamber 1 has been shown in Figure 1.

The drive of the sliver separating mechanism 2 is effected by a second electric motor 35, by means of a belt 36. All clutches 11, 14, 20 and the brake 26 are electromagnetically controlled.

Thus far, there has been described an embodiment of a spinning machine which is known. The new modification according to the invention consists in that a shaft 40 is driven from the transmission gear 27, by means of reduction gears 37, 38, 39, the said shaft 40 being provided with an electromagnetic clutch 41 for engaging or disengaging the shaft 40 the end of which is provided with a control finger 42. On a frame 43 of the spinning machine, on a circular plate 44 (see particularly Figure 2) four switches 45, 46, 47 and 48 are adjustably fixed in a circle. For an adjustable fixation of the said switches 45, 46, 47 and 48, the circular plate 44 is provided with slots 450 and, at the same time, it is provided with a numerical scale 49. The object of both the switches and the other parts will be described in the following description of a control mechanism 50 in which a complete electric circuit is concentrated, as shown in Figure 3. All clutches 11, 14, 20 and 41, the brake 26 and the electric motors 32, 35, are electrically connected with the control mechanism 50.

The control mechanism 50 has three push-buttons: a start push-button 51, a stop push-button 52 and a priming push-button 53.

The start push-button 51 is connected to a rectifier 54 and, via a main contactor 55, it switches on the main electric motor 32. At the same time it controls a time relay 56 which has a normally open contact 561 controlling an indicator lamp 57 and, further, a stop relay 58 which has two normally open contacts 581 and 582 the function of which will be described later.

The priming push-button 53 controls, via a contact 59, the electric motor 53. The contactor 59 has a contact 591 which con-

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trols a bimetallic-strip time relay 60 with its normally open contact 601. The contact 601 of the bimetallic-strip time relay 60 switches on a main relay 61, the latter having three contacts 611, 612 and 613.

- 5 The first contact 611 actuates either the electromagnetic brake 26 of the winding-on shaft 22 or the electromagnetic clutch 29 for the reverse running of the withdrawal shaft 13. The normally closed second contact 612, on opening actuates the clutch 41 and determines the start of the movement of the control fingers 42, whereas the normally open third contact 613, controlling also the clutch 41, terminates the movement of the control finger 42.

The control finger 42 controls four switches namely:

- 20 —the stop switch 45 which is the initial switch determining the initial priming operation;
- the feed switch 46 which controls a relay 62 which, by means of its normally open contact 621, engages the clutch 11 of the feed shaft 10 for the supply of sliver 9 into the separating mechanism 2; by means of its normally open other contact 622, the relay 62 bridges the feed switch 46;
- 25 —the withdrawal switch 47 which controls an operational relay 63 which has three contacts, the first contact 631 actuating either the clutch 26 for the reverse running, or the clutch 14 for the forward running, the normally open second contact 632 controlling the clutch 41 and stopping the control finger 35 42 from further rotation, the normally open third contact 633 bridging the withdrawal switch 47;
- 30 —the brake switch 43 which releases the operational relay 63 which, by means of its contact 631, engages the brake 26 or the clutch 26, or alternately it engages the clutch 14.

- 45 The stop push-button 52 cuts off the main electric motor 32 and the electric motor 35, the stop relay 58 which, by means of its first contact 581 controls the relay 62 via its contact 622 and, at the same time, the main relay 61. By means of its other contact 582, the stop relay 58 disconnects the rectifier 54 from a capacitor 65. The capacitor 65 is connected in the electric circuit in such a manner so as to supply the circuit of the clutch 20 or the brake 26 with energy should the power supply fail for any reason. In the same way, a capacitor 66 is designed to supply those elements which require energy when the machine is being stopped, as will be explained in the description of operation.

- 60 Starting the machine and operation of the control mechanism are as follows: by depressing the start push-button 51, the main electric motor 32 is switched on *via* the main contactor 55 and at the same time, on the one hand the time relay 56 is energized which,

after the main electric motor 32 has reached its full speed, turns on, by closing of normally open contact 561, the lamp 57 and, on the other hand, the stop relay 58 is energized which closes its two normally open contacts 581 and 582 whereby it prepares for operation the main relay 61 and the capacitor 65. The main electric motor 32, by means of the belt pulley 33 and the belt 34, starts to rotate the spinning chambers 1, as well as the transmission gears 31, 30, 29, 27, 37, 38, 39, 21, 15 and 12. The clutches 11, 14 and 20 are disengaged so that both the yarn withdrawal shaft 13 and the fibre feed shaft 10 are at rest. The winding-on shaft 22 is at rest under the effect of the brake 26, since the contacts 611, 631 and 582 connect the brake with the rectifier 54 whereby also the capacitor 65 is being charged. As soon as the lamp 57 is lit, it becomes possible to actuate the priming push-button 53 for a collective priming, which, owing to the closing of the contactor 59, switches on the electric motor 35 which actuates the separating mechanism 2. By closing of its normally open contact 591, the contactor 59 switches on the bimetallic-strip time relay 60 which meters the time required by the electric motor 35 to reach full speed. As soon as the respective time is up, the bimetallic-strip time relay 60, by closure of its normally open contact 601 switches on the main relay 61 which, by means of its first contact 611, disengages the brake 26 and engages the clutch 20 which in turn engages the reversing shaft 19 and, consequently, also the gearing 18, 17, 16 and the withdrawal shaft 13 starts to rotate in a reverse direction, so that the withdrawal rollers 4 start to return the yarn into the spinning chamber 1. The other normally closed contact 612 is opened, whereby the circuit of the clutch 41 is interrupted, the clutch 41 putting the control finger 42 into operation, which then moves from its initial position, away from the stop switch 45 onto the feed switch 46. Normally open contact 613 is simultaneously closed. As soon as the control finger 42 closes the feed switch 46, relay 62 is energized, thus engaging, by closing of its normally open contact 621, the clutch 11 which puts into operation the feed shaft 10 and, consequently, also the feed rollers 3 for feeding the sliver 9 into the separating mechanism 2 which separates out the fibres and conveys them into the spinning chamber 1. Contact 622 simultaneously bridges switch 46 and keeps relay 62 energized via contact 622, contact 581 and contact 601. However, the control finger 42 continues to move on onto the withdrawal switch 47. By closing the withdrawal switch 47 the operational relay 63 is actuated which simultaneously disengages, by means of its first contact 631, the clutch 20 for reverse running and engages the clutch 14 for forward 130

ward running that is, withdrawal of the yarn from the spinning chamber 1 takes place; by means of its normally open second contact 632, the relay 63 closes the circuit of the electromagnetic clutch 41, whereby a further movement of the control finger 42 is interrupted; by means of its normally open third contact 633, the relay 63 bridges the switch 47 which thus keeps the spinning machine running. Thus the priming is terminated.

Stopping the machine and operation of the individual elements take the following course:

By depressing the stop push-button 52, the main contactor 55 interrupts running of the two electric motors 32, 35. Simultaneously, energization of the stop relay 58 is interrupted which, by opening of its contact 581, de-energizes, via the contact 622, the relay 62 and the main relay 61. By means of its contact 21, the relay 2 disengages the clutch 11, whereby the feed of the sliver 9 is stopped and the bridging contact 622 is opened. By means of its contact 611, the main relay 61 prepares the brake 26 for operation. The third contact 613 is opened thus interrupting the circuit of the electromagnetic clutch 41. Although electric motor 32 has been disengaged from the power supply, due to the great number of spinning chambers being driven by the motor, the inertia thus obtained is considerable enough to be used for moving the control finger 42, during which the inertia persists. Thus, the control finger 42 starts to rotate away from the withdrawal switch 47 onto the brake switch 48. By depressing the brake switch 48 the operational relay 63 is brought out of action, which, by means of its contact 631, disengages the electromagnetic clutch 14 for the withdrawal of yarn 6 and, via the previously prepared contact 611, it engages the electromagnetic brake 26 for stopping both the withdrawal roller 4 and the winding-on roller 5. Under the inertia effect, the control finger 42 continues in its movement towards its initial position, that is, onto the stop switch 45. On closing of the stop switch 45, as relay 61 is de-energised and contact 612 is thus closed, the circuit of the electromagnetic clutch 41 is energized by the residual energy from the capacitor 66, the clutch 41 interrupting a further movement of the control finger 42. The thus stopped machine may be re-started by means of the start push-button 51, and collectively reprimed by means of the priming button 53.

If the current in the distributing network is interrupted for any reason without actuation of the stop push-button, capacitors 65 and 66 may be used as an emergency source of power, until the stop point is reached in the hereinbefore given sequence. Power for the clutch 41 and relay 63 being drawn from

capacitor 65 and power for clutch 14 and brake 26 being drawn from capacitor 65.

It is essential for the solution described that the control of the collective priming is effected gradually by means of four mechanically operated switches, the relative spacings of the switches determining certain time values required for a proper priming operation. Thus, the distance between the stop switch 45 and the withdrawal switch 47 determines the period needed for returning the yarn into the spinning chamber. The distance between the withdrawal switch 47 and the brake switch 48 determines the period needed for exhausting the rest of fibres in the spinning chamber 1 and, at the same time, it determines stopping of the yarn withdrawal in such a manner that the end of the yarn stays in the discharge tube. These distances may be easily adjusted, thereby to vary the periods needed.

#### WHAT WE CLAIM IS:—

1. A break-spinning device having a plurality of simultaneously primed break-spinning units, each of which is provided with a feed mechanism for the fibre supply, a break-spinning chamber, yarn withdrawal rollers which are rotatable in two directions, in a first of which directions yarn is withdrawn from the chamber and in a second of which directions yarn is fed back into the chamber, a yarn winding-on roller and a control mechanism to control, electrically, in adjustable time intervals, the said members of the machine, wherein the control mechanism for the electric control is connected to a stop switch which arrests the spinning device, a feed switch which controls the fibre feed, a withdrawal switch which controls the direction of rotation of the yarn withdrawal rollers and a brake switch which controls a brake of the yarn winding-on roller, the switches being adjustably arranged within an intervention region of a movable control finger which is driven from a main electric motor of the machine, via a clutch controlled by the control mechanism.

2. A device as claimed in claim 1, wherein the control finger is rotatable and the stop switch, the feed switch, the withdrawal switch and the brake switch are arranged around the rotatable control finger.

3. A device as claimed in claims 1 or 2, wherein the stop switch, the feed switch, the withdrawal switch and the brake switch are disposed on a plate, the latter being provided with a scale.

4. A device as claimed in claim 1, wherein the stop switch provides an initial rest position for the control finger and is interposed between the start of movement of the control finger and the feed switch which further controls a main relay of the control mechanism and the clutch, the clutch putting the control finger into operation, and wherein the feed

switch controls a relay which engages a clutch of a feed shaft of the feed mechanism the withdrawal switch controls an operational relay which controls clutches for the drive of the withdrawal roller in either direction, and the brake switch controls a relay which engages a brake of the winding-on roller.

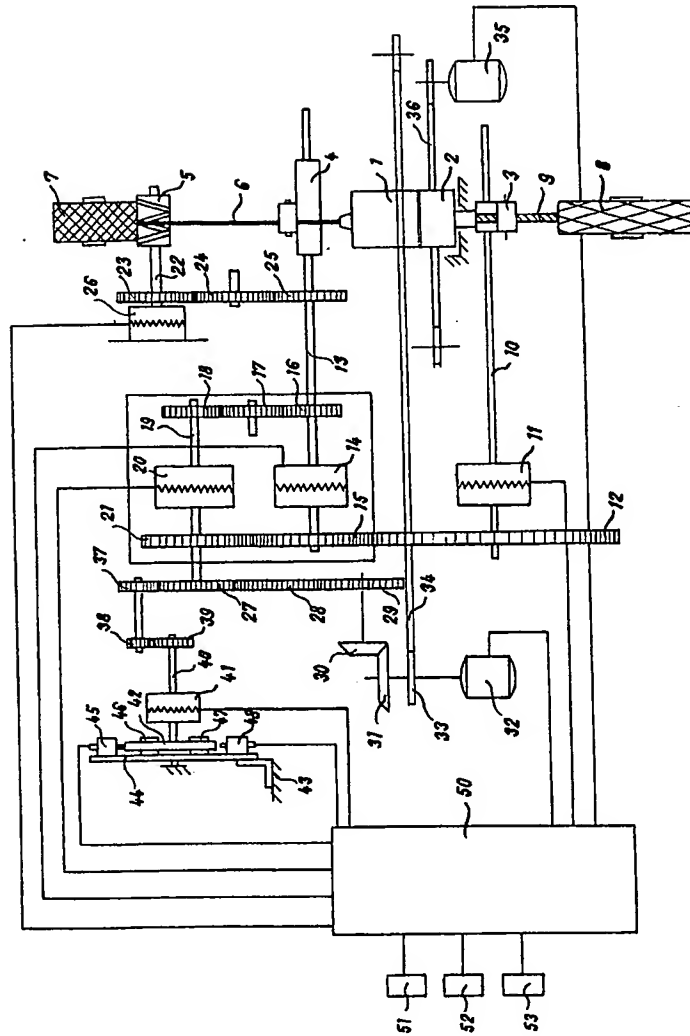
5. A device for starting and shutting off a break spinning machine substantially as here-

inbefore described with reference to the 10 accompanying drawings.

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**Fig. 1.**

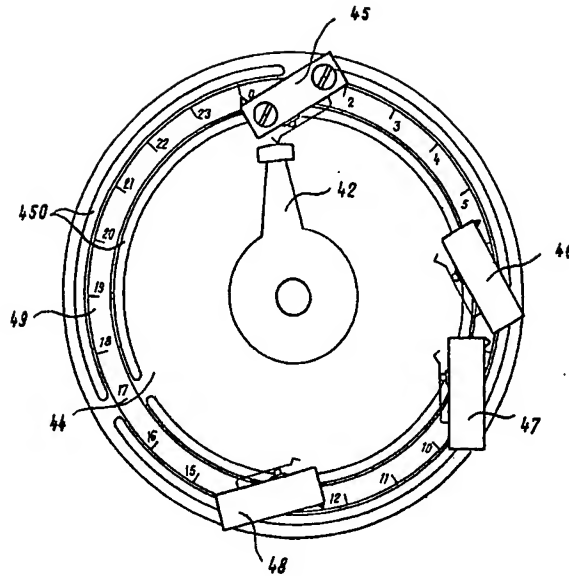


Fig. 2.

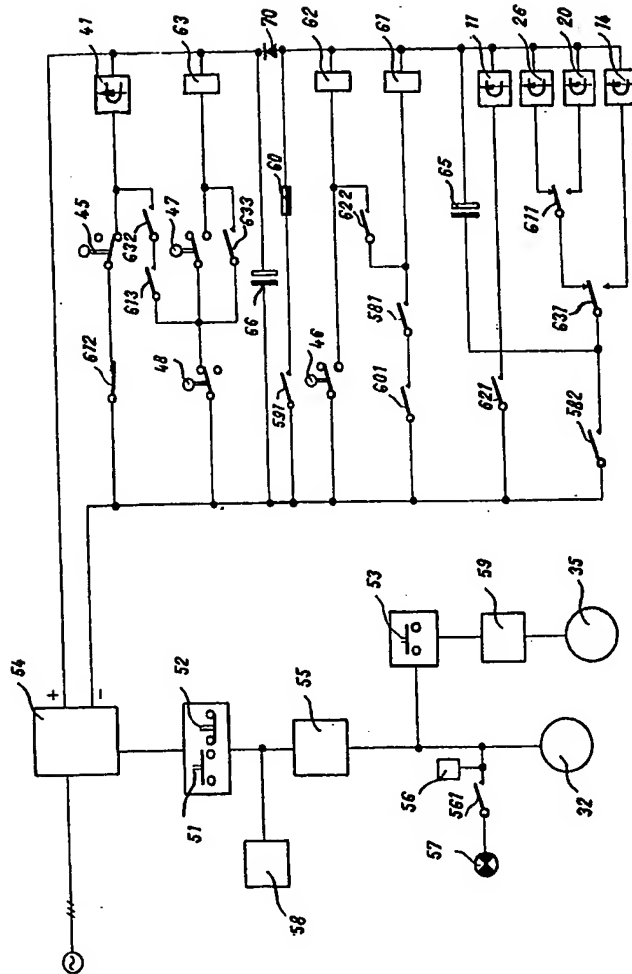


Fig. 3.